A STUDY OF FIVE HUNDRED CASES OF PLEURISY

OCCURRING AT THE PENNSYLVANIA HOSPITAL.

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The patients upon whom this report is based were admitted to the Pennsylvania Hospital from the years 1896 to 1905, the five-hundredth case being completed with the end of October, 1905, thus covering almost exactly a decade. I am indebted to all the visiting chiefs, medical and surgical, who have allowed me the use of their material and encouraged the investigation.

In this series only inflammatory conditions of the pleura have been included, the transudates, such as at times occur in cardiac and renal disease, are not considered. So, also, cases of chronic thickened pleura without symptoms or physical signs (other than impaired percussion note or diminished breath sounds) were deemed outside the limits of this report. In the course of the investigation of the hospital records a large number of cases diagnosed as pleuro-pneumonia were encountered and analyzed, and those which appeared to be frank croupous pneumonia with but a small patch of pleurisy coincident (as evidenced by a friction rub heard only over the consolidated area) were discarded. All pneumonic cases in which the pleurisy yielded effusion, or which distinctly preceded or followed the pneumonic process, are included.

It is to be borne in mind that all statistical studies are notoriously variable, and even at times contradictory, as must needs be the case when one considers how different are the sources from which such statistics are derived. The hospital whence this series is collected is in the most crowded portion of a large city; it lies not far from the river front; the slums are almost at its doors; and by far the greater portion of the foreign and negro population of the city live in its immediate vicinity. The hospital receives scarcely any pay patients. The wards are filled with the poorest and most destitute class, native and foreign, whose resistance to disease from the many exigencies incident to poverty, or to evil living, is reduced to the lowest terms.

It is obvious, then, that a study of this series could only be compared with others made under similar conditions, and that it in no way represents what might be termed an average series of cases. Certainly not in private practice could one expect to find such numerous and remarkable complications, and the long-neglected and distressing conditions which here are often added to the difficulties of treatment.

Prevalence. The 500 cases occurred in a period of ten years, the number increasing yearly, in relation to the total number of patients admitted, in quite uniform proportion.

Year.	Medical cases.	Pleurisy.	Per cent.
1896	1,128	20	1.77
1897	1,272	25	1.96
1898	1,401	34	2.42
1899	2,001	38	1.90
1900	2,100	49	2.33
1901	2,118	66	3.11
1902	2,471	70	2.83
1903	2,564	64	2.50
1904	2,275	65	2.86
1905	2,066	74	3.53
	19.396	505	2.52.

Norris' series of 500 cases of croupous pneumonia from the same hospital[1] occurred in four years, giving very fair means of comparison of the relative frequency of these diseases.

MENSAL FREQUENCY.

Winter: December, January, and February	138	
Spring: March, April, and May	156	
Summer: June, July, and August	120	
Autumn: September, October, and November	89	
First six months		304
Second six months		201
		505[2]

Pleurisy is, as may be seen from this table, more or less prevalent at all seasons of the year, but with decided tendency toward the colder months, and still more decided tendency toward the damper and wetter months. In the cold winter months, when snow and slush are frequent and winds high, the average is 52. In April, for some reason, there is a drop to 43, which is difficult to explain except by the element of chance which obtains in studies of a limited number of cases; but in May it rises to the highest total for the year, 62, to fall again in June to 43. After this time the average drops through the summer and early fall, reaching its lowest in October (20), and in the next two months rises again to 34, which is that of late summer, to take a larger rise at the beginning of the colder weather.

VITAL STATISTICS. In examining these tables we see that in children males and females are equally liable to the disease, but that after fifteen years of age, at which time their modes of life begin to differ, men are affected four times as frequently as women.

Regarding age, the table shows the remarkable fact that over one-third of the total number occurred in the decade between twenty and thirty years, and almost three-fifths in the score of years from twenty to forty. The ages are very variable, the youngest affected being but eleven months old, while at the other extreme of life two persons contracted pleurisy at the age of seventy-two.

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[1] AMER. JOUR. MED. SCI., June, 1901.

[2] The cases occurring in November and December, 1905, are added to complete the ten years.

Among the empyemas, of which it would seem of interest to make a separate table, we find that the tendency to pus formation appears to be much more marked in the young, and steadily decreases in later life. Leaving out the first five years, as there are no medical cases for contrast (the hospital not receiving medical cases under seven years of age), we see that in the next five years 50 per cent. were empyemas. In the next five years 43 per cent.; in the next five years 29 per cent.; in the next ten years 15 per cent.; in the next ten years 11 per cent., and in the next ten years 9 per cent. After fifty years the rate rises again to 17 per cent. in the next decade, and from sixty to seventy years 14 per cent.; but after seventy years there is no empyema in the 6 cases.

From fifty years on, however, the total number of cases is so relatively small that conclusions cannot be accurately determined. It may be of interest to note that in the ages from twenty to forty, through which period tuberculosis is most frequent, the empyema ratio is comparatively low.

Regarding empyema, men are affected three times as frequently as women, and here again the third decade of life furnishes the greatest number of cases, though not nearly in such marked degree as in the non-purulent cases.

Regarding the role which alcoholism is believed to play in the predisposition to disease, 102 of the 500 cases gave a distinct history of habitual indulgence in, or of excessive addiction to, alcohol. This is a high number when we consider the fact that from a number of the foreign patients a history could not be obtained, and that probably others deliberately concealed their excesses in this respect.

Males	389
Females	111
	500
Boys under fifteen years	25
Girls under fifteen years	23
Children	48
Adult men	364
Adult women	88

ALL CASES.

	No. of cases.	
Under five years of age	11	27
Over five and under ten years of age	16	
Over ten and under fifteen years of age	21	74
Over fifteen and under twenty years of age	53	
Over twenty and under thirty years of age	180	
Over thirty and under forty years of age	106	
Over forty and under fifty years of age	68	
Over fifty and under sixty years of age	32	
Over sixty and under seventy years of age	7	
Over seventy and under eighty years of age	6	
	500	

EMPYEMAS.

Males	70
Females	25
	95

	No. of cases.	
Under five years of age	11[3]	19
Over five and under ten years of age	8	
Over ten and under fifteen years of age	9	24
Over fifteen and under twenty years of age	15	
Over twenty and under thirty years of age	27	
Over thirty and under forty years of age	12	
Over forty and under fifty years of age	6	
Over fifty and under sixty years of age	6	
Over sixty and under seventy years of age	1	
	95	

NATIONALITY. Owing, as we have said, to the situation of the hospital and its class of patients, no general conclusions are warrantable from this table; but it must be surprising, nevertheless, to find that considerably less than half of our cases are native born, and that only one-third are white Americans—which may afford additional cause for reflection on the present increase of immigration.

The negro race furnishes more than one-eighth of the entire number of cases.

United States (white)	169
United States (colored)	65
Italy	152
Russia	37
Ireland	31
Austria	12
Germany	8
England	6
Greece	5
Rest of Europe	11
Canada	2
West Indies (colored)	2
Total	500

DURATION OF DISEASE PREVIOUS TO ADMISSION. Only one-seventh of the patients were admitted in the first three days of the disease; half came to the hospital between the fourth and the fifteenth days, with a slight preponderance to the latter half of the time. The poorer classes are indeed loath to enter a hospital, and they endure much before seeking such relief. In a later table it will be seen how serious is their delay. Twenty-two cases developed in patients already in the hospital (mostly empyemas following pneumonia).

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[3] Children under seven years of age are not admitted to the medical wards.

DURATION OF DISEASE ON ADMISSION TO THE HOSPITAL.

Less than twenty-four hours	8	
Over one day and less than four days	64	
Over four days and less than eight days	122	
Over one week and less than fifteen days	127	
Over two weeks and less than twenty-two days	48	
Over three weeks and less than one month	44	
Over one month and less than three months	40	
Over three months and less than six months	6	
Over six months and less than twelve months	5	
One year or over	5	
		469

DEVELOPED IN THE HOSPITAL.

Empyemas (following pneumonia)	15	
Pleurisies (following typhoid)	5	
Other cases	2	
		22
Unknown duration	9	9
Total		500

Occupations. Here is well illustrated the fact that occupation predisposes to disease. Attention should be called to the relatively large number of drivers and stevedores, besides the common laborers, all of whom lead exposed lives, and a majority of whom are addicted to alcoholic indulgence, even if not actually intemperate. Among the indoor occupations we find not less than 24 tailors —a graphic illustration of the evils of the sweatshop. Cooks and waitermen (nearly all colored) are well represented, and though this hospital is far removed from the factory district we find 9 operators; while among the comparatively few printers we have 8 cases. A number of persons lead lives which cannot be classified under either head, and I think that among this number pleurisy seems relatively frequent.

OCCUPATIONS OUTDOORS.

Laborers	168
Stevedores	13
Drivers	15
Sailors	5
Other outdoor occupations[4]	20
	221

OCCUPATIONS INDOORS.

Housework	65
Tailors (sweatshops)	24
Waiters	12
Cooks	11
Printers	8
Factory hands	9
Plasterers and paperhangers	5
Other indoor occupations[5]	63
	197

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[4] Includes farmers, police, peddlers, fishermen, etc.

[5] Includes barbers, clerks, salesmen, janitors, upholsterers, bartenders, etc.

OCCUPATIONS MIXED.

Children	46
Other mixed occupations[6]	36
	82

Past Medical History. One hundred and forty-eight gave a history of previous pulmonary trouble. This I think is a remarkably high percentage—almost a third, if we leave out the children under fifteen years of age. A rheumatic history was obtained in 46 cases, and 22 cases admitted specific disease; the latter proportion, it may be presumed, falling decidedly short of the actual number of syphilitics among the series. Of the acute infections only those occurring within the previous six months are admitted as having any bearing on the subject.

PULMONARY DISEASES.

Pneumonia (one attack)	53
Pneumonia (two attacks)	3
Pneumonia (three attacks)	2
Influenza (one attack)	18
Influenza (two attacks)	2
Old empyemas	5
Pleurisy (one previous attack)	40
Pleurisy (two previous attacks)	6
Pleurisy (three previous attacks)	1
Phthisis	9
Chronic bronchitis	4
Asthma	5
	148

GENERAL DISEASES.

Rheumatism (acute or subacute)	42
Rheumatism (acute, several attacks)	4
Syphilis (19 men and 3 women)	22
Plumbism	3

ACUTE INFECTIONS, RECENT, AND INFLAMMATIONS WITHIN SIX MONTHS.

Typhoid fever	8
Measles	2
Cholecystitis	1
Peritonitis	1
Perinephritic abscess	1
Hepatic abscess	1
Otitis media	1
Colitis	1
Tropical dysentery	1
Malaria	2
	19

Exciting Causes. The actual determining cause of the attack is here presented in the 233 cases in which such information could be elicited by either subjective or objective means. In connection with croupous pneumonia it is to be noted that 48 out of 52 cases of pleurisy following that disease were empyemas. In only 30 cases could direct evidence of tuberculosis, either pulmonary or miliary, be demonstrated antemortem. Traumatism accounts for 15 cases, and 12 cases developed immediately upon or after a debauch. The rather high number of 42 followed directly acute or subacute bronchitis, and perhaps some tuberculous cases may have been placed in this group, notwithstanding efforts at accuracy. Five cases occurred late in the course of typhoid fever, and a like number complicated acute articular rheumatism.

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[6] Includes carpenters, painters, plumbers, porters, hostlers, etc.

Exposure to cold, dampness, or sudden chilling	65
Following acute or subacute bronchitis	42
Following croupous pneumonia (of which forty-eight were empyemas)	52
Following traumatism (principally falls, broken ribs, and blows)	15
Occurred in the course of typhoid fever	5
Occurred in the course of acute rheumatism	5
Following phthisis (clinical, not with autopsy records)	14
Following a debauch (immediately)	12
Occurred in the course of double tertian malaria	1
Following influenza.	2
Following acute tonsillitis	2
Following obstinate constipation	2
Following obstinate vomiting	2
Following appendicitis	2
Following cholecystitis	1
Following pericarditis	1
Following miliary tuberculosis	1
Following gastritis (acute)	1
Occurred in plumbism	1
Occurred in secondary lues	1
Following subdiaphragmatic abscess	1
Following hepatic abscess	2
Following abscess of chest-wall	1
Following carcinoma of breast	1
Following anesthesia	1
	233

Onset. A chill is noted in almost one-third of the cases. Multiple chills occurred in 3 cases. Pain is, of course, the predominant symptom, and is stated in 433 cases, in 3 of which the pain was entirely abdominal, and in 8 others occurred in both chest and abdomen. Cough is also a constant symptom and is mentioned in 369, while actual dyspnœa occurs 272 times. Vomiting is frequent (37) and epistaxis is not rare. In 3 children the attack began with convulsions. Of the side principally affected we note practically no difference—242 right as to 228 left, and 30 double pleurisies.

Chill	148
Multiple chills	3
Pain in chest	430
Cough	369
Dyspnœa	272
Diarrhœa	5
Vomiting (one persistent)	37
Epistaxis	16
Pain in abdomen (3 only in abdomen, not in chest)	11
Convulsions	3
Syncope	2
Delirium	2
Hemoptysis	1
Abdominal distention	1
Coma (alcoholic)	1
Great tenderness of chest	2

Friction sounds were noted in 244 cases, in only 183 at the time of admission; but this fact is accounted for by the great number of patients who came to the hospital with large effusions of considerable duration. It appears that frictions during absorption are heard twice as frequently in left-sided effusion, and it is reasonable to think that the position and movement of the heart may play a part in its production.

Pleuropericardial rubs were noted 16 times, in 1 case the pleuritis being limited to the right side. Diaphragmatic friction are noted 6 times. One friction which had lasted two months was still present when the patient left the hospital, another lasted for five weeks, and in a third patient a friction rub existed for eleven weeks.

	Right.	Left.	Both right and left.	Total.
On admission	87	83	13	183
Developed during absorption or after aspiration	18	37	..	55
Pleuropericardial friction	1[7]	12	3	16
Diaphragmatic	4	2	..	6

Effusions. Three-fifths of the cases were serous effusions and one-fifth were purulent. In the other fifth no effusion occurred. In classifying the amount of effusion, the angle of the scapula was considered as one-third of the chest, the level of the scapular spine as two-thirds; all effusions above the spine were termed massive, while all below the angle were classified as basal. While not anatomically accurate, this classification appeared to be the simplest, and sufficiently correct for general comparison.

As might naturally be expected from the position of the heart, large effusions are more frequently left-sided.

On the right side there were 92 effusions of less than two-thirds and 105 two-thirds or more. On the left side there were 70 effusions of less than two-thirds and 110 two-thirds or more.

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[7] Undoubted.

Effusions.	Base.	1/3	2/3	Massive.	Total.
Right	38	54	69	36	197
Left	30	40	62	48	180
Right and left	7	12	2	3	24
	75	106	133	87	401

	Cases.	
Dry pleurisies	90	500
Serous effusions	315	
Empyemas	95	
Hydropneumothorax	4	
Pyopneumothorax	4	
Loculated empyemas	5	
Pulsating empyemas	2	
Pericardial effusions	4	

CARDIAC DISPLACEMENT. This sign was by no means as frequently mentioned as others, but notes were made in 216 cases. From the table will be seen the great variety of displacement possible. In those left-sided effusions in which no apex beat could be heard or felt in any part of the chest, and in which the sounds at the base of the heart were loud, it seems possible that there was actually posterior displacement of the apex to a limited degree; 17 such cases have been noted under that heading. When the lung has been compressed and no longer offers any support for the pericardium, it appears that merely by its own weight the heart may move away from the chest wall.

By far the greater number of cases in which marked displacement occurred were left-sided effusions. One left-sided case with two-thirds effusion had the apex in the normal position. In one massive effusion cardiac pulsation was seen, felt, and heard below and within the angle of the left scapula. One case had the apex beat in the fourth space beyond the right border of the sternum, and one case had the entire heart area to the right of the sternum, refused aspiration, and the heart gradually returned to its normal position in the fifth week.

	Up.	Up and to right.	Up and to left.	Down and to right.	Down and to left.	To right.	To left.	Post.
In right effusions	4	..	1	..	15	..	77	
In left effusions	9	20	..	6	..	56[1]	..	17
In right and left	3	2	1	..	..	..	5	

TEMPERATURE. In tabulating the temperature changes, it seemed advisable, for better comparison, to separate the cases into the acute, subacute, and more remote or chronic cases. Accordingly all cases admitted in the first week are classed as "recent," in the second and third weeks as "intermediate," and later than the third week as of "long duration." In 54 cases, 20 of which were empyemas, no temperature chart could be found. In the vast majority of cases the maximum temperature range was over 100° and less than 104°, and this held good for each subdivision as well. As might be expected, the greatest temperature reaction occurred in the most recent cases; 42 of the 60 cases exceeding 104°, being in the first subdivision, whereas in the 60 cases whose maximum lay between normal and 100° only 24 belonged to this class. In 21 cases (only 4 of which were admitted in the first week) a subnormal temperature existed throughout the disease.

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[1] Nine beyond sternum.

	Recent, 1st week.	Intermediate, 2 and 3 wks.	Long, over 3 wks.	Total.
Subnormal	4	5	12	21
Normal and below 100°	24	19	17	60
100° and below 102°	64	42	45	151
102° and less than 104°	81	38	35	154
Over 104° and less than 105°	23	10	6	39
Over 105° and less than 106°	15	1	1	17
Over 106°	4	0	0	4
	215	115	116	446

The highest temperature observed, 108.8°, occurred shortly before death in a maniacal patient who jumped from a window and was greatly shocked, though escaping without other injury. The lowest temperature observed, 94.6°, occurred in an alcoholic suffering from shock, fractured rib, and submersion, having fallen from a wharf into the river while intoxicated; he recovered. A distinctly hectic temperature was noted in 21 empyema cases, 11 tuberculous cases, and 2 simple serous effusions (1 in a child). A typical crisis was noted in 7 cases complicated by croupous pneumonia and in 1 with no pneumonia. Lysis was observed in 5 cases complicated by croupous pneumonia. Five cases of chronic empyema were absolutely afebrile. Five cases of long duration with high and irregular temperature on aspiration showed no pus. Two cases, undoubtedly tuberculous, were distinctly not hectic.

ASPIRATION. The amount aspirated usually was from 1000 c.c. to 2000 c.c., and but one aspiration was, as a rule, necessary. In only 20 cases the total amount of serum removed (by one or more aspirations) was over 3000 c.c. In all cases in which pus was found on aspiration, every effort was made to obtain consent for operation, and fortunately in nearly every instance was successful. The large number of exploratory aspirations made are not included in this table:

	1 asp.	2 asp.	3 asp.	4 asp.	6 asp.
Serum	124	25	7	4	0
Pus	33	4	1	..	0
Seropus	6	..	..	..	0
Serum, then pus	..	5	..	..	1

Hemorrhagic serum 8, bloody pus 3, aspiration followed by chills in 2 cases.

	Times.
Less than 500 c.c. removed	55
500 c.c. less 1000 c.c.	46
1000 c.c. less 2000 c.c.	94
2000 c.c. less 3000 c.c.	37
3000 c.c. less 4000 c.c.	8
4000 c.c. less 5000 c.c.	2

A total of over 3000 c.c. removed in 20 cases.

Largest: 9300 c.c. (6 asp.), 8700 c.c. (3 asp.), 7900 c.c. (4 asp.), 5900 c.c. (3 asp.).

Amounts: Largest amount at 1 asp. 4500 c.c.

Complications. The list is amazingly long and varied, over 50 different complications being noted, many of them sufficiently severe to add gravely to the prognosis. It seems scarcely credible that one-half of the cases were complicated, and tells graphically of the wretched class of patients which this hospital receives.

Of the more frequent complications, a word of explanation is necessary.

Nephritis heads the list, such a complication occurring 106 times. Only such cases as showed hyalogranular or granular casts are admitted, the presence of minute amounts of albumin, with or without hyaline casts and cylindroids, not necessarily indicating more than renal irritation. Under urine analysis this subject is more fully considered.

Croupous pneumonia occurred 56 times, either just antecedent to, during, or immediately following the pleuritis, and in every case contributed to the gravity of the condition, yet some remarkable results are recorded, not less than 3 cases having double pneumonia with empyema of one side, making perfect recoveries. One case had croupous pneumonia on one side and a large serous effusion on the other.

Bilateral pleuritis occurred 30 times, and I think may justly be considered as a complication, often most serious. Most frequently there was a large or massive effusion on one side, with a dry pleuritis or small effusion at the base of the opposite side, but in some instances there was quite a large effusion upon each side. In one case which came to autopsy an inflammatory effusion occupied one pleural cavity and a simple hydrothorax the other.

Phthisis or miliary tuberculosis could only be convincingly proved antemortem in 30 cases, though naturally suspected in many others. At autopsy it was frequently found, but almost always in those cases in which it had previously been diagnosticated, as they were the cases in which the death ratio was greatest.

Pericarditis occurred 9 times (in 2 cases of which there was only *right*-sided pleurisy). Acute endocarditis was found but 4 times. Pneumothorax is noted in 8 cases, 4 each with empyema and with serum. In 1 instance the air was admitted during aspiration. Abscess of the lung was found in 4 cases, all empyemas, and but 1 case of tumor occurred, probably a carcinoma. Abscess of the liver was found 4 times. Bronchopneumonia is comparatively infrequent, but 11 cases presented that complication. Other conditions will be found at length in the accompanying table:

COMPLICATIONS.

Total cases with one or more complications, 249.
Total complications noted, 360.

	Empyemas.	Serous	No effusion
(a) Pulmonary.			
Croupous pneumonia	23	25	8
Bronchopneumonia	1	6	4
Phthisis	8	16	3
Diffuse bronchitis	0	7	6
Abscess of lung	4		
Pneumothorax	4	4	
Miliary tuberculosis	0	3	
(b) Cardiac and Vascular.			
Acute endocarditis	2	1	1
Chronic endocarditis, v. h. d.	2	9	0
Pericarditis.	4	5	0
Myocarditis	1	1	1
Arteriosclerosis	0	2	0
Aneurysm	0	1	0
Thrombosis (fem.)	0	2[*]	0
(c) Renal.			
Nephritis	20	63	23

(d) Infectious Diseases.—Typhoid fever 4, malaria 2, syphilis 1, measles 2, varicella 1, erysipelas 1, dysentery 1.

(e) General Diseases.—Acute rheumatism 6, exophthalmic goitre 1, sciatica 1, cirrhosis of liver 1, locomotor ataxia, 1.

(f) Intoxications.—Plumbism 2, iodism 1, septicemia 4.

(g) Special Inflammations.—Otitis media 5, parotitis 1, tonsillitis 6, pharyngitis 1, cholecystitis 5 (4 in right-sided pleurisy), perihepatitis 2 (in right-sided pleurisy), acute gastritis 1, peritonitis 1, splenitis 1, salpingitis 1, endometritis 2.

(h) Dermatological.—Urticaria 1, erythema general 1, purpura 2.

(j) Miscellaneous.—Obstinate constipation 1, prolonged diarrhœa 4, acute alcoholism 4, mania 1, intestinal atony 1.

(k) Surgical Conditions.—Abscess of liver 4, fractured rib 3, abscess of back 2, necrosis of rib 2 (empyemas), perforation of diaphragm 1, perforation of chest-wall 1, tumor of lung 1.

Urine. The results of the examination of urine are of interest. Urine records were found in the histories of 470 cases. The examinations after 1898 were conducted in the Ayer Clinical Laboratory of the hospital, under the supervision of the Director; and from that time, at least, have been systematic and accurate.

It appears that acute nephritis is not more frequent in empyema than in other pleurisies, actually as 1 in 6 is to 1 in 6½. A particular investigation of the urine of admitted alcoholics revealed some surprising findings. In a general way it may be stated that their renal condition was either exceedingly bad or else entirely normal, and, surprising as it may seem, it was usually the latter. There was practically no intermediate condition. In two-thirds of the alcoholics the urine was entirely negative, whereas in only seven-sixteenths, or less than one-half of the non-alcoholics, was this the case.

Even allowing for the perhaps numerous alcoholics who were improperly classified, owing to concealment of their habits, still the proportions are considerably at variance with the accepted views on the relation of alcoholism and nephritis. Of the 40 patients who died, 8 gave an alcoholic history, which is exactly the same death rate for alcoholics and non-alcoholics. In pneumonia, as Norris has shown, the drunkards fare much worse.

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[*] 1 single, 1 double.

Acute nephritis was found in 77 cases and chronic nephritis in only 29 of the 500. In 16 cases casts were found, but not albumin; generally only hyaline casts. A few contained granular casts, and may be added to the list of chronic nephritis.

In but 14 cases were uric-acid crystals found, whereas calcium oxalate was found nearly as often, that is, in 10 cases.

Bile was found in 7 cases, nearly all complicated by cholecystitis; hemorrhagic nephritis occurred but thrice.

Cases in which urine was entirely negative	231	
Alcoholic cases in which urine was entirely negative	66	(out of 102 total).
Cases with only a trace of albumin and no casts	91	117 irritation.
Cases with only a trace of albumin and only hyaline casts.	26	
Cases with acute nephritis (albumin and casts)	16 empyemas, 61 not empyemas.	
Cases with chronic nephritis (albumin and casts)	4 empyemas, 25 not empyemas.	
Cases with no albumin, but showing casts	16	

	Cases.
Calcium oxalate	10
Uric acid	14
Bile	7
Hemorrhagic nephritis	3

Blood. The blood counts are by no means numerous, and apart from the leukocyte counts show little interest. As regards the erythrocytes, counts were recorded in but 21 instances, and these counts were made in complicated cases, in which other diagnostic points were involved. In 5 of these cases the counts were over 5,000,000, and in one was 6,000,000 after aspiration. In but 1 case was the count less than 3,000,000—a case complicated by ulcerative endocarditis.

The hemoglobin was estimated in but 27 cases, and the results are very variable. It was over 90 per cent. in 5 cases, 100 per cent. in 1 case, and generally speaking was uniformly high. Twice only, and then in complicated cases, was it below 55 per cent. Disproportionate oligochromemia was noted twice; in 1 case with over 5,000,000 red cells, the hemoglobin was but 45 per cent. In the tuberculous cases the leukocyte counts were the lowest, only in 2 instances (both cases of empyema) exceeding 10,000. In empyema (not tuberculous) the count was generally high, though in 1 instance it was below 6000 and in 3 others below 10,000.

In complicated cases the leukocyte counts usually rose considerably above the counts in the simple serous pleurisies, but in only 2 cases were over 50,000, both of which had croupous pneumonia. The Widal reaction as resorted to occasionally was disappointing. In 10 cases with typhoid-like condition, but not typhoid fever, the reaction was negative; but in 9 cases, also undoubtedly not typhoid fever, 4 positive and 5 highly suggestive reactions were obtained, and no history of recent typhoid infection could be obtained.

In 3 cases of miliary tuberculosis the Widal reaction was suggestive twice and negative once. Blood cultures were resorted to four times; in one instance a pure culture of pneumococcus was obtained, which was also found in all cultures postmortem. Malarial organisms were found twice in fresh blood preparations.

LEUKOCYTE COUNTS.

	Less than 6,000.	6,000–10,000.	10,000–20,000.	20,000–30,000.	30,000–40,000.	Over 50,000.
In empyema (non-phthisical)	1	3	19	10	6	1[10]
In phthisical cases of all kinds	6	4	2[11]			
In non-complicated pleurisies	12	20	22	2		
In complicated pleurisies	5	16	25	10		1[10]

SPUTUM. Many examinations of the sputum were made, but the results may be briefly tabulated as follows: Tubercle bacilli were found in 3 empyemas, and in 11 other cases. Pneumocci were found in 6 empyemas, and in 18 other cases.

THE EFFUSIONS. In almost all the serous cases the specific gravity was between 1015 and 1025. The amount of albumin present was more variable, but usually ranged between 15 and 40 grams per liter. In 2 cases the albumin was extremely high; once 70 and once 80 grams per liter. The bacteriological examination of the exudates was as follows:

	Tubercle bacillus.	Pneumococcus.	Streptococcus.	Bac. col. communis.	Sterile.
In the examination of aspirated pus	1	24	10	0	11
In the examination of aspirated serum	2	13	1	3	50

	1010–1015.	1015–1020.	1020–1025.	1025–1030.
Specific gravity of effusion	3	15	24	1

	Under 1000.	1010–1015.	1015–1020.	1020–1030.	1030–1040.	1040–1050.	1070.	1080
Albumin, grams per liter	2	4	10	13	13	5	1	1

In 1, effusion sugar was found; in 1, liver cells and tyrosin bundles; in 1, liver cells and hematin and bilirubin crystals. In 1, empyema cholesterin crystals were found. In 2, empyemas following hepatic abscess, examinations were made for amœba with negative results. In the single case of tumor, blood cells and endothelial cells were numerous.

CYTODIAGNOSIS AND INOSCOPY. A series of 22 cases of pleural effusion was studied by Dr. G. C. Robinson, resident pathologist at the Pennsylvania Hospital, with the following results: In 19 cases the small mononuclears were from 95 to 100 per cent. of the count. Three showed a polymorphonuclear excess (1 seropurulent). Cultures were negative in all of the 9 cases examined.

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[10] Pneumonic.

[11] Both complicated.

Inoscopy after Jousset's method, in 15 cases, showed tubercle bacilli in 2 cases (1 in pericardial fluid). In 1 case that showed tubercle bacilli in the sputum there was an effusion with polymorphonuclear excess in the count.

PHYSICAL SIGNS AND SYMPTOMS. Bulging of the chest or obliteration of the interspaces is noted as occurring in 15 empyemas and 50 serous effusions. Movable dulness is noted but 40 times. Egophony was noted in 5 empyemas and 48 serous (usually small) effusions. Pectoriloquy occurred in 8 cases, bronchophony in 3, amphoric breathing in 4, bell tympany in 5, metallic tinkling in 3, and succession splash in 2 cases. Skodaic resonance is mentioned in but 4 cases, probably because it is so frequently found that it is not considered worthy of record. Distant bronchial breathing over an effusion is almost as frequent as is the absence of breath sounds.

A difference in the mensuration of the two sides of the chest is mentioned but 15 times; twice it was said to be the same on both sides. The liver was found displaced appreciably below the costal border 68 times, in all but 9 of which effusion was right-sided (5 times with a massive left effusion and twice with the left-sided effusion complicated by a cholecystitis). The spleen was found displaced appreciably below the costal border 23 times, in all but 2 of which effusion was left-sided (malaria, typhoid, etc., omitted).

Jaundice was noted in 5 cases; herpes in 5 cases with pneumonia, and in 8 cases without pneumonia. Hemoptysis occurred in 3 cases. A putrid odor of the breath was found in all the 4 cases of abscess of the lung.

Œdema of the chest occurred 8 times. Pulsation of the right side was observed in a left-sided effusion where pericardial adhesions were present. Extreme abdominal distention was noted in 1 case. Marked tenderness to light pressure or percussion over the affected side was present in 9 non-purulent cases. Persistence of friction was noted in 1 case eleven weeks, in another eight weeks, and in another five weeks.

Anisocoria was noted in 7 cases, in one of which, complicated by locomotor ataxia, the Argyll-Robertson pupil was observed. In the other 6 the pupil was larger on the affected side five times and smaller once.

Subcutaneous emphysema occurred after aspiration in 1 case, but rapidly disappeared without bad effect. Delirium was noted late in the course of the disease in non-alcoholics four times.

Meningismus was present in one child, and hemicrania of the affected side was also once noted. In 1 case of double pleurisy with marked physical signs there were practically no symptoms. Another case had a typical abdominal onset, no pulmonary symptoms, and an effusion was found in the course of a routine examination of the chest. The tuberculin test employed three times was twice positive and once negative. Skiagrams in 3 cases located missing drainage tubes in the pleural cavity, and in 1 case a grooved director, which was recovered from the chest a week after the original operation.

A few anomalies of pulse and respiration are worth recording. In 1 massive effusion the highest respiration-rate was 24. In another with both friction and effusion it was 20. In 1 case with a temperature of 105° respirations were 28, and in 1 case with a subnormal temperature the respirations were 44. In 1 case with large effusions the highest pulse-rate was 64. In another with respirations 36, the pulse was but 72; and in another with respirations 40, the pulse was 80. In still another case with the respirations 54, the pulse was but 104, and later on in convalescence went as low as 54. In another case with very great cardiac displacement the pulse was never over 96, and it fell to 48 after aspiration as the heart returned to its normal position.

Results of Treatment. It is impossible in this paper to review the medicinal treatment of such a series of cases. The number and combinations of various drugs employed defies analysis, but we may note that strapping of the chest is always reported as giving prompt and marked relief of pain, cough, and dyspnœa.

We may, however, review and contrast those cases which received only medical treatment with those in which aspiration was in addition performed, and we may also see what was accomplished by operation in cases of empyema. Furthermore, we may learn to what extent early treatment influenced the course and termination of the disease, and finally we may inquire into the causes which brought to a fatal termination 40 of the cases in which medical and surgical resources were exhausted in vain.

Again, we have for convenience divided the cases into those of short (first week), medium (second week), and long (over two weeks) duration, and will consider separately the serous effusions, the empyemas, and those cases in which no effusions occurred.

Three hundred and seventy patients were discharged as cured, and 90 others left the Hospital, of whom all but 4 were improved at the time of their discharge; 38 of these patients left against the advice of the physicians in charge, and the other 52 represent mostly phthisical patients and cases of empyema which still had sinuses that were referred to the out-patient department in order to make place in the wards for more acute and urgent cases. None of these cases are included in the results, though they were nearly all practically cured at the time of their discharge.

Early treatment shows remarkable results, as evidenced by a study of the 78 cases which were admitted in the first three days of the disease. Of these, 40 never developed effusion, 18 a slight basal effusion, and 8 an effusion of one-third of the chest; none of these 66 cases required aspiration. But 2 developed large effusions, and the other 10 were empyemas (mostly pneumonic).

Of the 78 cases admitted in less than 4 days from onset:

No effusion	40	None required aspiration.
Base	18	
One-third	8	
Large effusion	2	
Empyema	10,	all pneumonic but 1 trauma and 1 abscess of liver.

CURED.

	1 wk.	2 wks.	3 wks.	4 wks.	5 wks.	6 wks.	2 mos.	3 mos.	4 mos.	5 mos.	6 mos.	1 yr.	
No Effusion.													
Short duration	29	23	7	8	2	..	..	..	..	..	..	..	69
Med. duration	4	6	1	2	0	1[12]	0	1[12]	..	..	..	..	15
Long duration	3	1	0	1	..	..	..	..	..	..	..	..	5
Serum.													
Short duration	10	21	16	12	6	7	2	0	1	..	..	..	75
Med. duration	5	22	27	12	12	5	0	2	1	..	..	..	86
Long duration	12	10	16	11	11	4	2	4	0	..	..	..	70
Pus.													
Short duration	..	..	..	1	0	1	2	9	5	0	1	1[13]	20
Med. duration	..	..	..	0	0	1	0	1	2	2	..	..	6
Long duration	..	..	..	3	2	3	4	6	4	2	..	..	24
Total	63	83	67	50	33	22	10	23	13	4	1	1	370
Deaths	16	7	4	2	3	1	2	3	1	0	1	..	40

Died	Pus 21.	Left against advice, improved	34
	Serum 16.	Left against advice, not improved	4
	No effusions 3.	Discharged improved, including phthisis and empyema still with sinuses	52
		Total	500

Of the dry pleurisies we find the great majority cured in the first two weeks (36 in the first week); and the average duration before cure was fifteen days for the entire series, including complicated cases; 77 per cent. of this series were admitted in the first week of disease.

Of the 231 serous effusions the average was twenty-five days, and half the cases were cured in the second and third weeks.

The time of admission is very evenly divided between the short, medium, and long periods, but is slightly in favor of the medium.

Of 320 non-purulent cases all but 13 were cured in less than two months.

With the empyemas we find a very different state of affairs. Almost all the cases were admitted early (generally with pneumonia, developing the empyema in the hospital), or else after the effusion had been established for some weeks, and of these two classes there are almost an equal number, only 6 of the 50 cases being admitted in the second week.

Vastly different also is the table of recoveries and duration of treatment. No patient was cured in less than four weeks, and the average is ninety days, or exactly three months, in which column are found one-third of the cases. On the other hand, all but 6 patients were cured in four months or less, and these were severely complicated.

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[12] Complicated.

[13] Child with numerous complications.

TAPPING VS. NON-TAPPING IN SEROUS EFFUSION. In comparing the results achieved in which mechanical interference was employed with those in which no such procedure was attempted, it soon became obvious that only uncomplicated cases could be fairly contrasted. The complications varied so greatly in severity, in some cases lengthening the course of the disease by many weeks, and in others having little or no such influence, that deductions from these cases would be decidedly misleading.

In the accompanying table, which details all the complicated and uncomplicated cases, it will at once be seen how variable are the results in the cases with complications, for in these cases it appears that those not tapped recovered much the sooner. The facts are, that the complications were much severer in those tapped, and possibly for that very reason the aspiration became imperative. Only cases discharged as cured are considered, and slight effusions at the base are not included, as in no cases were such aspirated:

COMPARISON OF EFFUSIONS TAPPED AND NOT TAPPED.

TAPPED.

UNCOMPLICATED.	1 wk.	2 wks.	3 wks.	4 wks.	5 wks.	6 wks.	2 mos.	3 mos.	4 mos.	Average in days.
One-third	4	6	3	2	..	..	..	..	..	15.4
Two-thirds	5	8	19	4	2	0	1	..	..	20.1
Massive	2	6	2	8	6	1	..	..	..	24.7
Mean average										20.6
COMPLICATED.										
One-third	1	0	2	4	1	3[14]	1[14]	..	..	31.5
Two-thirds	..	1	0	2	2	2	1	3	..	50.4
Massive	0	2[14]	2	3	4	2[14]	2	..	..	32.7

NOT TAPPED.

UNCOMPLICATED.	1 wk.	2 wks.	3 wks.	4 wks.	5 wks.	6 wks.	2 mos.	3 mos.	4 mos.	Average in days.
One-third	2	5	2	6	1	1	..	..	..	21.8
Two-thirds	0	2	8	2	2	1	..	..	..	24.3
Massive	0	0	1	0	2	1	0	1	1	55.0
Mean average										28.0
COMPLICATED.										
One-third	2	2	7	1	2	1	1	..	..	24.0
Two-thirds	0	0	0	0	3	1	..	..	..	37.0
Massive	..	..	..	..	..	..	..	..	..	....

To recapitulate, it appears that, taken as a series, uncomplicated cases of serous effusions aspirated recovered in three weeks, whereas another week was necessary to effect a cure in the non-aspirated. Strangely enough, the contrast is more marked in the small effusions than in those of moderate size.

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[14] Includes double pleurisies with other complications.

In the massive effusions the contrast is mostly afforded by those patients who refused aspiration, and the encouraging average of 24.7 days in the aspirated as against 55 days in the other group makes further comment unnecessary regarding aspiration in such cases.

It is but fair to say, however, that in hospital practice aspiration is performed under the most favorable conditions possible for asepsis, and with the best chances for combating any hitch or emergency that may arise in the proceeding.

In private practice, on the other hand, I am of the opinion, taking all the factors into consideration, that in an uncomplicated serous effusion not exceeding what is here termed "one-third" of the chest, aspiration should at least be delayed until it becomes evident that absorption will not occur naturally in two weeks, as it did quite frequently in the non-aspirated small effusions in this series.

Treatment of Empyema. These statistics emphasize the fact that in resection alone is there safety. Even then in 75 resected cases there were 13 deaths. The mortality is high at all times, 22 per cent. for our entire series, but only 17 per cent. for those resected, as against 40 per cent. for those not resected. In those cases in which simple incision and drainage was performed the mortality was 27 per cent., and in those not drained 5 out of 9 died; of the other 4, only 1 was cured at the time of leaving the hospital, which they did notwithstanding earnest protest.

Mortality and Causes of Death. No uncomplicated case of non-purulent pleurisy died. Three cases of pleurisy without effusion succumbed, but 2 of them occurred late in the course of typhoid fever, and the third was an alcoholic patient, who developed delirium tremens; death occurred in 16 of the 315 serous effusions (5 per cent.). The mortality for the entire series (40) is exactly 8 per cent., which for hospital cases is not unduly high. A majority of the deaths occurred early (16 in the first week after admission), and consisted mostly of those cases complicated by pneumonia and acute nephritis, and of empyemas moribund from septicemia.

The causes of death were as follows:

IN EMPYEMA.

Septicemia	7	(1 with pericarditis)
Pneumonia	3	(1 with nephritis)
Abscess of lung	2	
Phthisis.	2	(1 with malaria)
Nephritis	2	(1 with myocarditis)
Endocarditis	1	(with tuberculosis)
Pericarditis.	1	(with peritonitis)
Abscess of liver	1	(with perforation of diaphragm)
Exhaustion after operation	2	
Total	21	

IN NON-PURULENT CASES.

Pneumonia, croupous	3
Pneumonia, senile	1
Pneumonia and alcoholism	1
Pneumonia and phthisis	1
Miliary tuberculosis	1
Miliary tuberculosis and abscess of liver	1
Miliary tuberculosis and pericarditis	1
Typhoid fever and nephritis	2
Acute nephritis	1
Pericarditis and femoral thrombosis	1
Pneumothorax and tumor of lung	1
Abscess of liver	1
Cirrhosis of liver	1
Acute mania and shock	1
Ruptured aneurysm	1
Septicemia (with purpura)	1
Total	10

I venture to think that this table accounts fully for as high a death rate as 8 per cent. In only those 2 patients who died of exhaustion after operation might a different result have been expected, and had not operation been performed the end would have surely been fatal.

Autopsy Notes. Autopsies were performed in 22 cases, of which 11 were empyemas. In the non-purulent cases pulmonary tuberculosis, acute, subacute, or chronic, or a general miliary tuberculosis was found in 9 cases. In 2 of them there was tuberculous pericarditis, and in 2 the effusion was hemorrhagic. Carcinosis of the pleura was found in 1 case. Among the empyemas, but 1 had pulmonary tuberculosis. Pericarditis was found three times (twice with right-sided empyemas). Five loculated empyemas occurred. Evidently in this disease there is attempt to wall off the pus, but in 2 cases it found an outlet rupturing into the bronchi; in 1 also infiltrating the axillary tissue, and in 1 the chest wall. Acute endocarditis was found in 1 case. In 1 case of typhoid fever a double empyema was present. Abscess of the liver was found twice, and femoral thrombosis also twice.

Conclusions. 1. Pleurisy occurs at all ages, but most frequently from twenty to thirty.

2. Pleurisy is most frequent in the spring and least in the fall.

3. Pleurisy affects children under fifteen with equal frequency for boys and girls, but is four times as frequent in men as in women.

4. The colored race is particularly susceptible.

5. Occupation seems to have a decided predisposing effect.

6. Croupous pneumonia is the most frequent cause of empyema, and bronchitis, or simple exposure to dampness and cold, seems to be more frequently the exciting cause of pleurisy than tuberculosis or rheumatism (as far as clinical evidence is found).

7. Complications are frequent in hospital practice.

8. Aspiration shortens appreciably the course of the disease, and usually requires to be performed but once to effect a cure.

9. Examination of the blood is but moderately helpful and of doubtful value, as are also cytodiagnosis and inoscopy.

10. Empyema is always dangerous, and its natural course almost invariably fatal. Resection and free drainage is the proper treatment.

THE RELATION OF THE KIDNEYS TO GASTRO-ENTEROLOGY.

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In a broad way, renal diseases may be classified as follows: (1) Neoplasms, of interest mainly to surgeons and pathologists. (2) Local pathological lesions, such as infarcts, scarcely diagnosticable. (3) Parasitic disease: (*a*) gross animal parisitism, rare in this climate; and (*b*) bacterial infections, septic, gonococcic (ascending), tuberculous, exanthematous (included as a matter of convenience), and other acute infections. (4) Traumatisms. (5) Necrosis. (6) Displacements. (7) Calculus disease and certain forms of urinary obstruction. (8) Inflammations or degenerations, involving the kidneys generally (Bright's disease, etc.). (9) Functional disturbances: (*a*) motor, impossible, except in an indirect sense of involvement of the vessels in ischemia and congestion; (*b*) secretory, excessive, deficient, or perverted; and (*c*) sensory, neuralgia (also, true neuritis of the kidney).

While almost any kind of disease of any part of the body may occasionally produce, or be accompanied by, some definite disturbance of digestion or call for special attention to diet and metabolism, the following partial classification of renal conditions is suggested as pertinent to our consideration: (1) Mechanical influences: (*a*) movable kidney, and (*b*) calculus disease and urinary obstruction. (2) Chemical and allied influences: (*a*) acute nephritis; (*b*) chronic nephritis; (*c*) renal paresis and paralysis; (*d*) polyuria; and (*e*) urinary abnormalities secondary to digestive and metabolic disturbances, without strict renal disease.

The relatively large number of cases of movable kidney encountered in digestive practice must be significant. Even gynecological series do not usually show more than 10 per cent. Ralph C. Larrabee[1] found 112 cases among 272 women—41.5 per cent. Wolkow and Delitzin[2] found 46 per cent. Others have reported an incidence of 60 to 80 per cent. The personal equation must enter into the matter. I have considered as movable only those cases which

[1] Boston Med. and Surg. Jour., November 26, 1903.

[2] Die Wanderniere, 1899.